UW Mesoscale Ensemble

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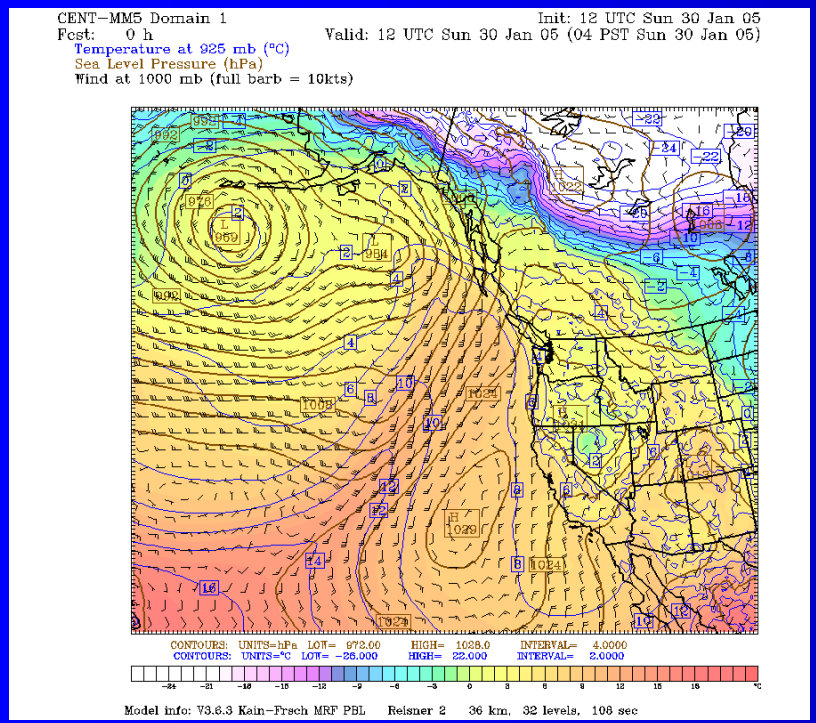
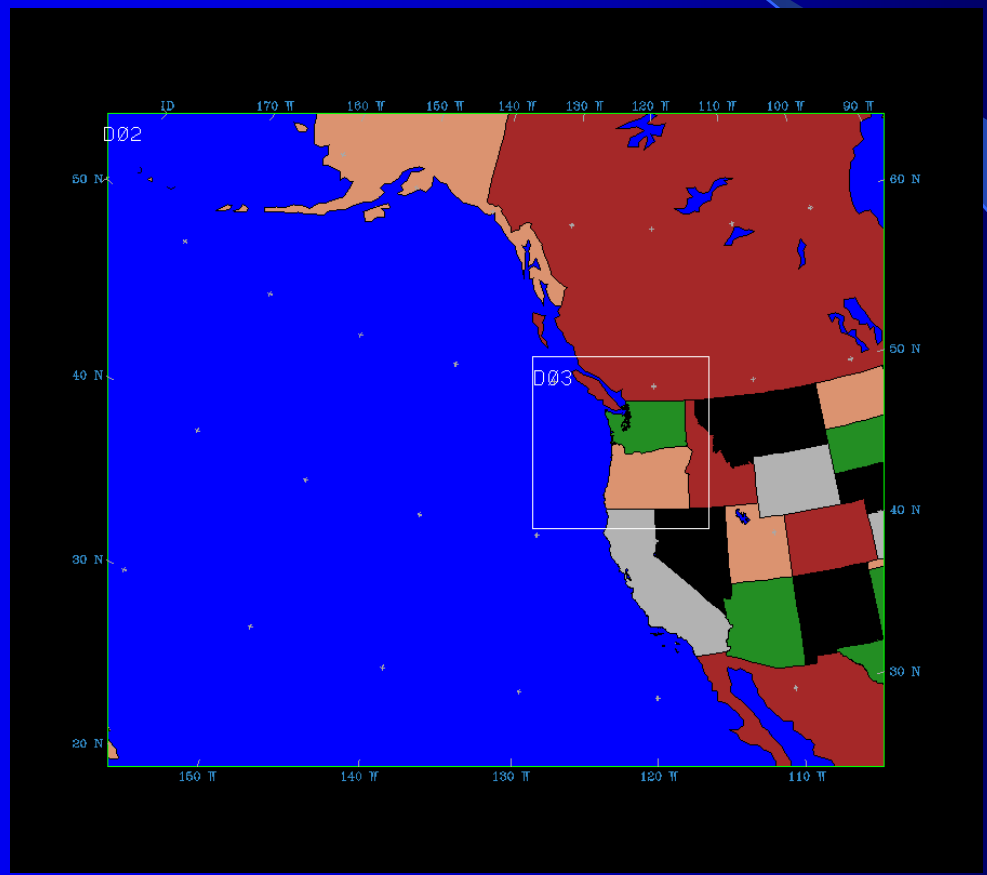
What is the UWME?

2 Mesoscale Ensemble systems

- Core : 8 members, 00 and 12Z
  - Each uses different synoptic scale initial and boundary conditions
  - All use same physics
- Physics : 8 members, 00Z only
  - Each uses different synoptic scale initial and boundary conditions
  - Each uses different physics
  - Each uses different SST perturbations
  - Each uses different land surface characteristic perturbations
- Centroid, 00 and 12Z
  - Average of 8 core members used for initial and boundary conditions



Ensemble domain



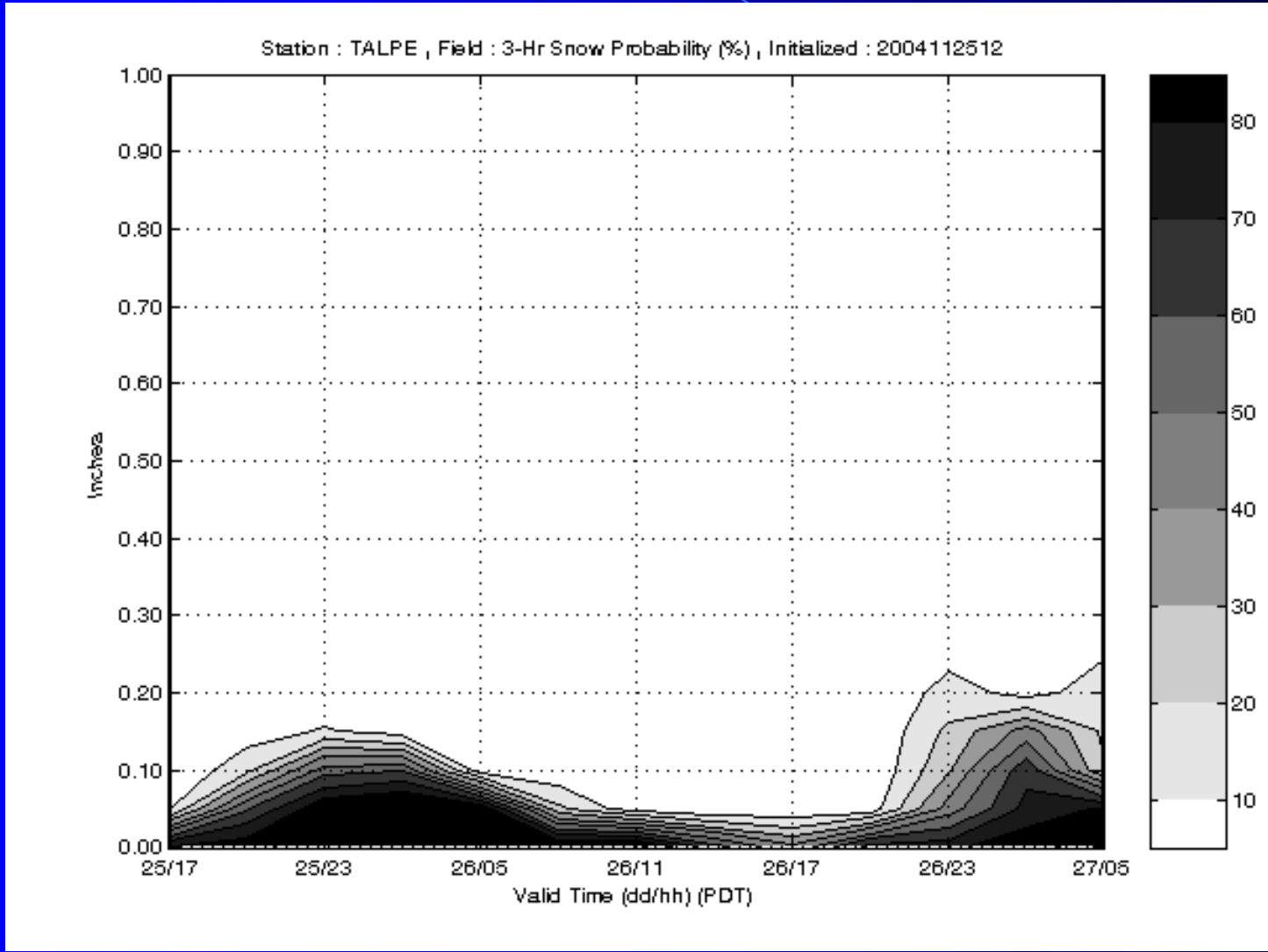
Current International Multi-Analysis Collection

Abbreviation/Model/Source	Type	Resolution (~ @ 45 °N) Computational	Resolution (~ @ 45 °N) Distributed	Objective Analysis
gfs, Global Forecast System, National Centers for Environmental Prediction	Spectral	T254 / L64 ~55km	1.0° / L14 ~80km	SSI 3D Var
cmcg, Global Environmental Multi-scale (GEM), Canadian Meteorological Centre	Finite Diff.	0.9° / L28 ~70km	1.25° / L11 ~100km	3D Var
eta, Eta limited-area mesoscale model, National Centers for Environmental Prediction	Finite Diff.	12km / L60	90km / L37	SSI 3D Var
gasp, Global AnalysiS and Prediction model, Australian Bureau of Meteorology	Spectral	T239 / L29 ~60km	1.0° / L11 ~80km	3D Var
jma, Global Spectral Model (GSM), Japan Meteorological Agency	Spectral	T106 / L21 ~135km	1.25° / L13 ~100km	OI
ngps, Navy Operational Global Atmos. Pred. System, Fleet Numerical Meteorological & Oceanographic Cntr.	Spectral	T239 / L30 ~60km	1.0° / L14 ~80km	OI
tcwb, Global Forecast System, Taiwan Central Weather Bureau	Spectral	T79 / L18 ~180km	1.0° / L11 ~80km	OI
ukmo, Unified Model, United Kingdom Meteorological Office	Finite Diff.	5/6°×5/9°/L30 ~60km	*same* / L12	3D Var

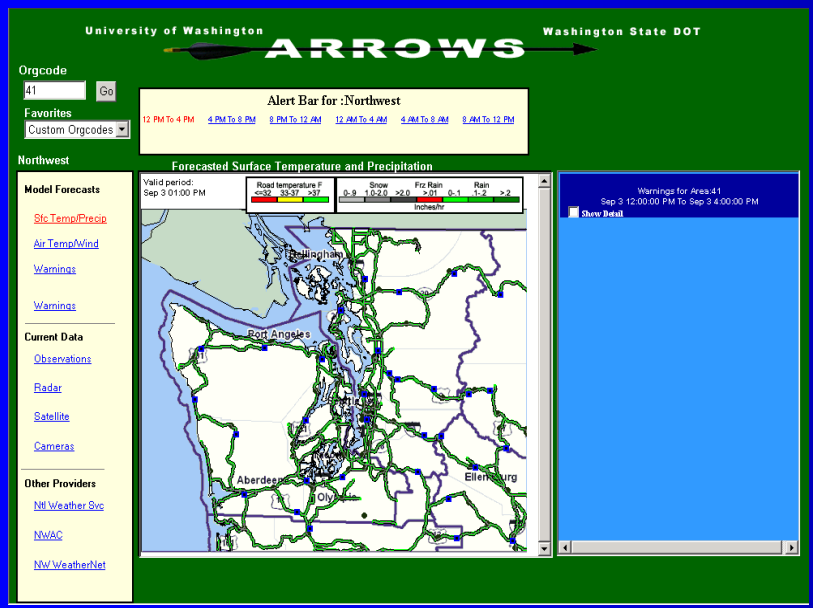
Why an ensemble?

- Probabilistic forecast products
- A way to estimate forecast uncertainty

Probabilistic forecasts

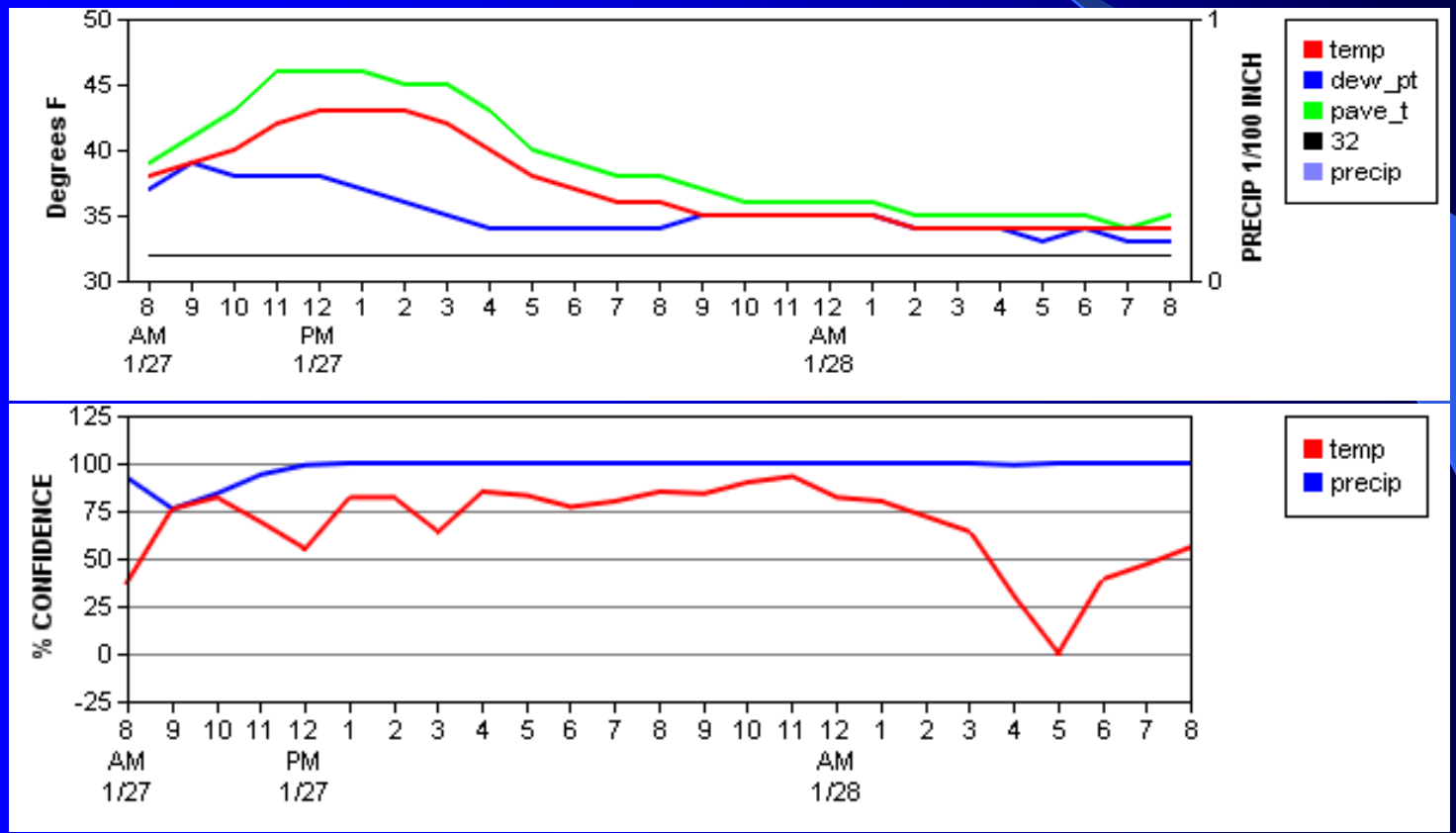


Ensemble Applications



- WSDOT's ARROWS
  - First ensemble-based web page for transportation weather in Washington

ARROWS Forecasts



ARROWS Uncertainty

- Based on UWME spread
- 0% confidence if :
  - current spread > 3 month mean spread + 2 SD
- 100% confidence if :
  - Current spread < 3 month mean spread – 2 SD

Recent UWME changes

- Move CORE to new xeon cluster
- Run members MPI (4 nodes each) instead of OpenMP (1 node each)
- Upgrade physics
- Changes took effect 2005-01-25 1200 UTC

Old CORE configuration

- 36 and 12 km nested MM5
- Simple ice microphysics
- Simple Dudhia radiation
- Kain-Fritsch cumulus parameterization
- MRF PBL scheme
- 5-Layer soil model
- Climo soil moisture data
- Eta soil temperature data
- Navy OTIS SST data
- 32 vertical levels
- 48 hour forecasts

Current CORE configuration

- 36 and 12 km nested MM5
- Reisner II microphysics
- CCM2 radiation
- Kain-Fritsch cumulus parameterization
- MRF PBL scheme
- Bucket soil moisture model
- RUC soil moisture data
- Eta soil temperature data
- Navy OTIS SST data
- 32 vertical levels
- 48 hour forecasts

Old UWME CORE Timing

- ETA 12:30 AM/PM
- GFS 1:00
- TCWB 1:30
- CMCG 2:30
- UKMO 3:00
- NGPS 3:30
- GASP 6:00
- JMA 4:00
- CENT 6:00

UWME CORE Timing

- ETA 8:30 AM/PM
- GFS 9:30
- TCWB 10:00
- CMCG 10:30
- UKMO 11:00
- NGPS 11:30
- GASP 12:30
- JMA 12:30
- CENT 1:00

Future UWME changes

- Move physics ensemble from OpenMP to MPI cluster configuration
- Change relative physics configurations to be more focused on mesoscale variability

Revised UWME / UWME+ MM5 Physics Configuration

UWME / UWME+ Version 2.0 **E. Grimit** **11/10/04**

	PBL		Surface	Microphysics	Cumulus		Radiation	SST	Soil Temp	Land Surface
		moist vert diff	Physics			shallow			& Moisture	Parameters
UWME	MRF	Y	5-Layer	Reisner II	Kain-Fritsch	N	CCM2	Navy OTIS	RUC	default LANDUSE.TBL
UWME+										
gfs+	Gayno-Seaman	N	LSM	Reisner II	Kain-Fritsch	Y	CCM2	SST_pert01	RUC	LANDUSE.TBL.plus01
cmcg+	Yonsei	Y	LSM	Reisner II	Grell	N	CCM2	SST_pert02	RUC	LANDUSE.TBL.plus02
eta+	Eta	N	LSM	Reisner II	Grell	Y	CCM2	SST_pert03	RUC	LANDUSE.TBL.plus03
gasp+	MRF	Y	LSM	Reisner II	Kain-Fritsch	N	CCM2	SST_pert04	RUC	LANDUSE.TBL.plus04
jma+	MRF	Y	5-Layer	Reisner II	Grell	Y	CCM2	SST_pert05	RUC	LANDUSE.TBL.plus05
ngps+	Eta	N	5-Layer	Reisner II	Kain-Fritsch	N	CCM2	SST_pert06	RUC	LANDUSE.TBL.plus06
tcwb+	Yonsei	Y	5-Layer	Reisner II	Kain-Fritsch	Y	CCM2	SST_pert07	RUC	LANDUSE.TBL.plus07
ukmo+	Gayno-Seaman	N	5-Layer	Reisner II	Grell	N	CCM2	SST_pert08	RUC	LANDUSE.TBL.plus08

Perturbations to:

1) Moisture Availability

2) Albedo

3) Roughness Length

Summary

- UWME is now an operationally relevant forecasting tool
- Model physics are improved
- Forecasts are much more timely
- Forecasts are much more reliable
- Many more possible applications